



ATOP-R&D

Human Factors Newsletter # 05-17

September 3, 2005 – September 16, 2005

Articles in this newsletter:

- *Using Eye Movement Activity as a Correlate of Cognitive Workload*
- *Information Organization for a Portal Using a Card Sorting Technique*
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Technical Note: The following manuscript has been submitted to *Ergonomics* for publication: Ahlstrom, U., & Friedman-Berg, F. J. (2005). *Using Eye Movement Activity as a Correlate of Cognitive Workload*.

Abstract. We explored the relationship between subjective workload ratings and eye activity measures from a high-fidelity human-in-the-loop weather simulation. First, we assessed the relationship between subjective workload ratings and the task load variable aircraft density. We found that workload ratings increased linearly with an increasing number of aircraft. Second, we assessed how eye activity measures of saccades, blinks, and pupil diameter correlated with aircraft density. We found that the mean blink duration and the mean saccade distance decreased as a function of an increased number of aircraft, while the mean pupil diameter increased as a function of an increased number of aircraft. Third, we explored the possibility of using this eye data to predict the minute-by-minute number of aircraft in the sector by means of multiple regression and neural network models. Using regression modeling, we were able to produce individual controller models (R ranging from .19 to .89) and a general model ($R = .58$) with good mean prediction performances. Using neural network models, we produced individual controller models ($r = .26$ to $r = .92$) and a general model ($r = .84$) with even greater mean prediction performances. We discuss possible applications for these findings in adaptive automation, future air traffic control (ATC) research, and interface design.

This research activity supports the Administrator's Flight Plan Goal for increased Safety, Objective 7: Enhance the safety of FAA's air traffic systems.

Points of Contact: U. Ahlstrom, A. Clark, WJHTC

Technical Note: Ahlstrom, V. & Allendoerfer, K. (2004). *Information Organization for a Portal Using a Card Sorting Technique*. (DOT/FAA/CT-TN04/31) Atlantic City International Airport, NJ: Federal Aviation Administration, William J. Hughes Technical Center.

Abstract: The Office of Knowledge Management (ACK-1) at the William J. Hughes Technical Center (WJHTC) is sponsoring development of a web-based portal for employees. The portal will centralize and standardize numerous information systems currently used by WJHTC employees in their work. To increase the usability of the system, the office tasked the National Airspace System (NAS) Human Factors Group to conduct several user-centered design and usability testing activities. This technical note describes the methodology used in one of those activities.

In order for the portal to be successful, the information needs to be organized so that users can find what they need quickly and accurately. The challenge for the portal designers is how to organize the information to achieve this goal for portal users. Different users or user communities may have very different views and priorities regarding the information contained in the portal. It is not at all clear which items belong together or what hierarchical categories would make sense to the users.

Card sorting is a technique used to gain insight on how users mentally categorize information. By performing a card-sorting task, researchers can create a taxonomy and organize information in a way that corresponds to how intended users of a system think about the information the system contains. By basing the organization on the results of the card sort, the system is more likely to match the mental model of the users, facilitate their ability to find information, and achieve good usability. This technical note describes the card-sorting methodology and the techniques for analyzing results. We use the employee portal project as a running example to discuss the methodology and the benefits and drawbacks of different analysis techniques.

Researchers from the WJHTC created a list of information items to include in the portal based on high priority items provided by the sponsor, items currently in the intranet, and structured interviews with potential end users. The researchers created sets of cards where each card contained one of the items from the list. Participants sorted the cards into groups based on their own ideas of where items belong and then named each group. Once all of the participants completed the card sort, the data were analyzed using a set of converging methods to determine overall categories and organization. The first method examined the categories and identified patterns that were similar across participants. The researchers followed this by two more quantitative methods: cluster analysis and factor analysis. The researchers found an agreement between the methods.

The result of the card-sorting task was a taxonomy that provided an initial structure to the portal. The taxonomy will be verified and refined through iterative usability testing.

This research activity supports the Administrator's Flight Plan Goal for Organizational Excellence, Objective3: Make decisions based on reliable data to improve our overall performance and customer satisfaction.

Points of Contact: V. Ahlstrom, K. Allendoerfer, WJHTC

Traffic Management: Research psychologists from the William J. Hughes Technical Center's NAS Human Factors Group are working with Supervisory Traffic Management Specialists from

the field to define operational scenarios for the Traffic Situational Display (TSD) baseline study. The scenarios will represent common, daily use of the TSD as well as complex traffic management situations such as flow constraints due to weather. They will be used to collect baseline data on task load and flow of information. In the future, these data will be used to evaluate the Traffic Flow Management System, which will replace the TSD. *This research activity supports the Administrator's Flight Plan Goal for Greater Capacity, Objective 3: Increase on-time performance of scheduled carriers.* (T. Yuditsky, A. Clark, WJHTC)

ATC Voice Transmissions: During the week of August 28, 2005, Roni Prinzo traveled to Wageningen, The Netherlands to present a poster and chair one session at the 5th International Conference on Methods and Techniques in Behavioral Research. The poster was derived from the contents of the OAM Technical Report entitled *Terminal Radar Approach Control: Measures of Voice Communications System Performance* (in press). The poster's focus was on the approach taken to analyze voice transmissions using waveform and spectral analysis techniques, and the software used to develop databases and conduct statistical analyses. *This research activity supports the Administrator's Flight Plan Goal for Increased Safety, Objective 7: Enhance the safety of FAA's air traffic systems.* (R. Prinzo, CAMI)

More information on human factors research can be found at the FAA Human Factors (ATOP-R&D) web site: <http://www.hf.faa.gov>

Paul Krois
FAA (ATO-P R&D Human Factors)



September 18-22, 2005 - XVIIth World Congress on Safety and Health at Work, Orlando, FL <http://www.cdc.gov/niosh/exhibits.html>

September 19-23, 2005 – ANA 2005 Aviation Conference and Exhibition, Connecticut Convention Center, Hartford, CN <http://www.aerospace-na.com/ace2005.asp>

September 20-21, 2005 - R,E&D Advisory Committee Meeting (joint meeting with NASA's Aerospace Research Advisory Committee), Bessie Coleman Auditorium, FAA Headquarters, Wash., DC Gloria.dunderman@faa.gov

September 20-22, 2005 – Second Safety Across High-Consequence Industries Conference, Saint Louis University, St. Louis, MO http://parks.slu.edu/msasm_conference/index.html.

September 20-24, 2005 - 1st Congress of the International Society for Cultural and Activity Research (ISCAR), Seville, Spain iscar2005@iscar.org

September 21-23, 2005 - Cargo Facts 2005- 11th Annual Aircraft Symposium, Sheraton Hotel & Towers, Seattle, Washington ashoemaker@cargofacts.com

September 25-28, 2005 - 11th Ka and Broadband Communications Conference and 23rd AIAA International Communications Satellite Systems Conference 2005 (organized by IIC), Aurelia Convention Center, Rome, Italy <http://www.aiaa.org/>

September 26-28, 2005 - AIAA 5th Aviation, Technology, Integration, and Operations Forum (ATIO), Hyatt Regency Crystal City, Arlington, VA <http://www.aiaa.org/>

September 26-28, 2005 - AIAA 2nd Intelligent Systems Conference (IS), Hyatt Regency Crystal City, Arlington, VA <http://www.aiaa.org/>

September 26-29, 2005 - Infotech@Aerospace, Hyatt Regency Crystal City, Arlington, VA <http://www.aiaa.org/content.cfm?pageid=1>

September 26-30, 2005 – Human Factors and Ergonomics Society 49th Annual Meeting, Royal Pacific Resort at Universal Orlando, Orlando, FL <http://hfes.org/meetings/menu.html>

September 27-30, 2005 - Analyzing Risk: Science, Assessment, and Management, Harvard School of Public Health, Boston, MA <http://www.cdc.gov/niosh/exhibits.html>

October 3-6, 2005 – SAE 2005 AeroTech Congress and Exhibition, Gaylord Texan Resort and Convention Center, Dallas/Fort Worth Airport Area, Texas
<http://www.sae.org/events/conferences/aerospace/>

October 4-5, 2005 - Aerospace Council, Grapevine, TX elizd@sae.org

October 6-9, 2005 – Aviation North Expo Conference, Fairbanks Princess Riverside Lodge, Fairbanks, AK www.AviationNorth.org

October 9-11, 2005 – Aviation Maintenance Star Symposium, Ritz-Carlton, Phoenix, AZ
www.STARSymposium.com

October 10-13, 2005 - S-7 Flight Deck & Handling Qualities Standards for Transport Aircraft Toulouse, France mlemank@sae.org

October 17-21, 2005 - American Association for Aerosol Research 2005 Annual Conference, Hilton Austin, Austin, TX <http://www.cdc.gov/niosh/exhibits.html>

October 18-20, 2005 - S-9 Cabin Safety Technical Committee Meeting, Phoenix, AZ,
mlemank@sae.org

October 18-21, 2005 - [2005 SAE Control & Guidance Systems Committee Meeting No. 96](#)
Harbor Town Resorts, Hilton Head, South Carolina, USA

October 20-21, 2005 – 2nd Annual FAA International Safety Forum, Westfields Marriott, Chantilly, VA <http://www.faa.gov/news/conferences/safetyforum/index.cfm?topic=6>.

October 22-26, 2005 – American Medical Informatics Association Annual Symposium, Hilton Washington, Wash, DC <http://www.amia.org/meetings/annual/current/>

October 23-26, 2005 - UIST 2005, Eighteenth Annual ACM Symposium on User Interface Software and Technology, Seattle, WA <http://www.acm.org/uist/index.html>

October 24-25, 2005 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

October 24-26, 2005 – 43rd SAFE Symposium, Grand America Hotel, Salt Lake City, UT <http://www.safeassociation.org/symposium.htm>

October 24-27, 2005 - [DoD Maintenance Symposium & Exhibition](#)
Sheraton Birmingham Hotel and Birmingham-Jefferson Convention Complex, Birmingham, Alabama,

October 25-26, 2005 - 2005 International Symposium: Beyond Regulatory Compliance, Making Safety Second Nature, Reed Arena, Texas A&M University, College Station, TX <http://www.cdc.gov/niosh/exhibits.html>

October 26-28, 2005 – Air Cargo Americas, Radisson Centre, Miami, FL www.aircargoamericas.com

October 26-28, 2005 - A-10 Aircraft Oxygen Equipment Committee Meeting, Salt Lake City, UT mlemank@sae.org

October 27-28, 2005 - Second International Conference on Knowledge Management ICKM2005, Westin Charlotte, Charlotte, NC <http://www.asis.org/ICKMcall.htm>

October 30-November 7, 2005 – ATCA 50th Annual Conference and Exposition, Dallas, TX http://www.atca.org/event_items.asp.

October 30—November 3, 2005 – 24th Digital Avionics Systems Conference, Hyatt Regency Crystal City, Wash., DC <http://www.dasconline.org>

November, 2005 – DoD TAG (Human Factors Engineering Technical Advisory Group) Meeting, Baltimore, MD <http://hfetag.dtic.mil/meetschl.html>

November 3-5, 2005 - AOPA Expo, Tampa, Florida www.aopa.org

November 3-5, 2005 - Conference on Designing for User Experience, Fort Mason, San Francisco, CA <http://www.dux2005.org/>

November 6-9, 2005 - ACI World / Pacific Conference and Exhibition, Auckland, New Zealand.
www.auckland-airport.co.nz

November 7-9, 2005 – DoD TAG, Baltimore, MD <http://hfetag.dtic.mil/meetschl.html>

November 7-10, 2005 – Flight Safety Foundation 58th Annual International Air Safety Seminar, Moscow, Russia http://www.flightsafety.org/iass05_cfp.html

November 7-10, 2005 - Ergonomics and Human Factors: Applications in Occupational Safety and Health, Harvard School of Public Health, Cambridge, MA
<http://www.hsph.harvard.edu/ccpe/programs/EHF.shtml>

November 8-10, 2005 – Aerospace Testing Expo, North America: Scientific Conference and Technology Forum, Long Beach Convention Center, Long Beach, CA
<http://www.aerospacetesting-expo.com/northamerica/conf+forum.html>

November 8-10, 2005 – Maintenance, Repair & Overhaul Exhibition Asia, Suntec Convention Center, Singapore <http://www.aviationnow.com/conferences/masmain.htm>

November 10, 2005 - 34th Annual Meeting of the Society for Computers in Psychology, Toronto, Ontario, Canada <http://www.scip.ws>

November 10 - 13, 2005 - 46th Psychonomic Society Annual Meeting, Toronto, Ontario, Canada <http://www.psychonomic.org/meet.htm>

November 15-17, 2005 - National Business Aviation Association's 58th Annual Meeting & Convention, New Orleans, LA (TBD) www.nbaa.org

November 16-17, 2005 – IEE Human Factors Engineering Professional Network/MoD Human Factors Integration Defense Technology Center “People and Systems Symposium: Who Are We Designing For?”, Grange City Hotel London, UK <http://conferences.iee.org/pas2005>

January 9-12, 2006 - 44th AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV <http://www.aiaa.org/>

January 22-26, 2006 – TRB 85th Annual Meeting, Washington, DC <http://trb.org/calendar/>

January 23-27, 2005 - S-18 Safety Assessment for Airborne Systems & Equipment San Antonio, TX, lemon@sae.org

February 9-10, 2006 - Swinburne University Symposium on Safety Management and Human Factors Symposium, Melbourne, Australia janca@groupwise.swin.edu.au
<http://www.swin.edu.au/aviation/forms/2006SwinburneSymposiumCallforPapers.pdf>

February 21-26, 2006 – Asian Aerospace 2006, Changi Exhibition Centre, Singapore
www.asianaerospace.com

March 13-15, 2006 – Flight Safety Foundation 18th Annual European Aviation Safety Seminar, Athens, Greece <http://www.flightsafety.org/seminars.html#eass>

March 20-23, 2006 – 16th Annual AAMI/FDA International Conference on Medical Device Standards and Regulation, Hyatt Regency, Reston, VA
<http://www.aami.org/meetings/isc/index.html>

March 22 - 25, 2006 - Society for Behavioral Medicine Annual Meeting and Scientific Sessions, San Francisco, CA www.sbm.org/annualmeeting/index.html

March 23-25, 2006 - 17th Annual International Women in Aviation Conference, Opryland Hotel Nashville, TN <http://www.wai.org/>

March 23-27, 2005 – IA Summit 2006, Hyatt Regency, Vancouver, BC, Canada
<http://www.iasummit.org/>

April 4-10, 2006 – Sun ‘n Fun, Lakeland, FL <http://www.sun-n-fun.org/content/>

April 6-7, 2006 – National Human Capital Summit, Chicago Marriott Downtown, Chicago, IL
http://www.humancapitalinstitute.net/conference_national.html

April 22-27, 2006 – CHI 2006, Montreal, Quebec, Canada
<http://www.chi2006.org/call/hcioverviews.php>

April 23-28, 2006 - Avionics Systems Division Meeting, New Orleans, LA (TBD)
lemon@sae.org

April 25-27, 2006 – Maintenance, Repair & Overhaul (MRO) Conference & Exhibition, Phoenix Civic Plaza, Phoenix, AZ <http://www.aviationnow.com/conferences/mromain.htm>

May 1-4, 2006 - 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference; 14th AIAA/ASME/AHS Adaptive Structures Conference; 7th AIAA Gossamer Spacecraft Forum; 2nd AIAA Multidisciplinary Design Optimization Specialist Conference; 1st AIAA Non-Deterministic Approaches Conference, Hyatt Regency Newport, Newport, RI <http://www.aiaa.org/>

May 9-11, 2006 – Flight Safety Foundation 51st Annual Corporate Aviation Safety Seminar, Phoenix, AZ <http://www.flightsafety.org/seminars.html#eass>

May 14-18, 2006 - 77th Annual Scientific Meeting of the Aerospace Medical Association, Caribe Royale Hotel, Orlando, FL <http://www.asma.org/>

May 22-24, 2006 - 9th IFAC Symposium on Automated Systems Based on Human Skill And Knowledge, Nancy, France <http://www.cdc.gov/niosh/exhibits.html>

May 25-28, 2006 – American Psychological Society 18th Annual Convention, New York Marriott Marquis, New York City, NY <http://www.psychologicalscience.org/convention/>

June 11-14, 2006 – The American Society of Safety Engineers Safety 2006 Conference, Washington State Convention and Trade Center, Seattle, WA
<http://www.asse.org/2006pdcallforpapers.pdf>

June 12-16, 2006 – UPA 2006 – 15th Annual Conference, Broomfield, CO
http://www.usabilityprofessionals.org/conferences_and_events/upa_conference/2006/

June 24-26, 2006 – AAMI Conference & Exposition, Wash, DC
<http://www.aami.org/proposals/index.html>

June 26-29, 2006 - [General Aviation Technology Conference](#) , Hyatt Hotel, Wichita, Kansas,

July, 2006 - 26th International Congress of Applied Psychology, Athens, Greece
dgeorgas@dp.uoa.gr ,
http://www.erasmus.gr/dynamic/conventions.asp?conv_id=21r/dynamic/conventions.asp?conv_id=21

July 10-14, 2006 – IEA 2006, 16th World Congress on Ergonomics, Maastricht, The Netherlands
<http://www.iea2006.org/>

July 24-30, 2006 – EAA AirVenture, Oshkosh, WI <http://www.airventure.org/>

August 10-13, 2006 – American Psychological Association Annual Meeting, New Orleans, LA
<http://www.apa.org/convention05/future.html>

August 21-24, 2006 - AIAA Modeling and Simulation Technologies Conference and Exhibit. Keystone Resort and Conference Center, Keystone, CO
<http://www.aiaa.org/content.cfm?pageid=1>

August 21-24, 2006 - AIAA Guidance, Navigation, and Control Conference and Exhibit, Keystone Resort and Conference Center, Keystone, CO
<http://www.aiaa.org/content.cfm?pageid=1>

September 6-8, 2006 - 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Renaissance Portsmouth, Portsmouth, VA,
<http://www.aiaa.org/content.cfm?pageid=1>

September 10-14, 2006 - 54th International Congress of Aviation and Space Medicine, Bangalore, India. A preliminary registration form may be found at <http://www.isam-india.org/conference44/newreg.php>.

October 15-19-2006 – Digital Avionics Systems Conference, Hilton Portland, Portland, OR

<http://www.dasconline.org/>

September 25-27, 2006 - 6th AIAA Aviation Technology, Integration and Operations Forum, Hyatt Regency Wichita, Wichita, KS <http://www.aiaa.org/content.cfm?pageid=1>

October 23-25, 2006 – 44th Annual SAFE Symposium, Reno Hilton Hotel, Reno, NV
<http://www.safeassociation.org/symposium.htm>

October 23-26, 2006 - DoD Maintenance Symposium & Exhibition, Reno Hilton, Reno, Nevada <http://www.sae.org/events/conferences/aerospace/>

January 8-11, 2007 - 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV <http://www.aiaa.org/content.cfm?pageid=1>

Note: Calendar events in Italics are new since the last Newsletter



Comments or questions regarding this newsletter?
Please contact Bill Berger at (334) 271-2928
or via e-mail at [bill.ctr.berger @faa.gov](mailto:bill.ctr.berger@faa.gov)